

CHAPTER 5

TEMPERATURE/DEWPOINT SENSORS

SECTION I. DESCRIPTION AND LEADING PARTICULARS

5.1.1 INTRODUCTION

This chapter provides field service information for the model H083R and 1088 temperature/dewpoint sensors (hygrothermometers). The only difference between the H083R and 1088 sensors is that the 1088 sensor is equipped with diagnostic circuitry and software. The H083R has no automatic diagnostic capability. The information in this chapter includes physical description, installation, operation, theory of operation, and preventive and corrective maintenance for both sensors. Any differences between the sensors are clearly noted in the text and drawings. A separate functional drawing for each sensor is provided.

5.1.2 PHYSICAL DESCRIPTION

5.1.2.1 Introduction. Each of the model H083R and 1088 hygrothermometers, developed by the Technical Services Laboratory for the National Weather Service (NWS), functions as a thermometer and dewpoint indicator. The sensors indicate dewpoint and ambient temperatures in the range of -80 to +130 degrees Fahrenheit (°F). Resolution is 0.1°F.

Temperature/dewpoint sensor accuracies are as follows:

Ambient temperature	±1 degree, -58°F to +122°F ±2 degrees through remainder of operational range
Dewpoint temperature	±2°F RMSE, +30°F to +86°F ±3°F RMSE, -10°F to +30°F ±4°F RMSE, -30°F to -10°F

5.1.2.2 Physical Components. Each of the sensors consists of two separate components, as shown in figure 5.1.1: an aspirator and a transmitter. The aspirator is mounted to the transmitter via a mounting bracket assembly. The transmitter is mounted to the sensor mounting pole via a 3-3/4 circular mounting sleeve. The transmitter is connected to the data collection package (DCP) via a power cable and two fiberoptic cables. The DCP receives temperature, dewpoint, and diagnostic data (model 1088 only) from the sensor via the fiberoptic cables. The DCP formats the temperature/dewpoint measurement data and diagnostic data and transmits these data to the acquisition control unit (ACU) via either line drivers or an rf communications link. The ACU processes the measurement data via the measurement algorithm and outputs the measurement results to the various ASOS peripheral devices.

5.1.2.3 Principles of Operation. The model H083R and 1088 hygrothermometers both use a chilled mirror method to measure dewpoint. By definition, the dewpoint of a sample of air is the temperature at which the water vapor in the air condenses. In the chilled mirror method, a mirror is cooled to the point where a fine film of condensate is present on the mirror's surface.

The temperature of the mirror at this condition is equal to the dewpoint temperature. The presence of condensation is detected by the reflection of an infrared light off the surface of the mirror. Internal circuits of the model H083R and model 1088 refrigerate a small mirror, and by using an optical feedback loop, maintain the mirror at exactly the temperature at which the mirror surface is slightly clouded with condensed

water vapor from the sampled air. A precision thermal sensor embedded in the mirror measures the temperature. A similar thermal sensor located in a sample of the ambient air measures the ambient air temperature.

5.1.2.4 **Aspirator 2MT4A1.** The aspirator (figure 5.1.2) consists of two FRU's: Housing Assembly A1A2 (with built-in fan) and Dewpoint Sensor Assembly A1A1. The dewpoint sensor assembly consists of a sensor card (ambient and dewpoint sensing circuitry), its mounting frame, and the aspirator cable (connects to transmitter). The dewpoint sensor assembly contains additional diagnostic circuitry that monitors airflow through the aspirator and is used to detect a fan failure. This fan failure circuitry is monitored by model 1088 only.

5.1.2.5 **Transmitter 2MT4A2.** The transmitter (figure 5.1.3) consists of an outer protective housing, chassis subassembly, transmit logic board, calibrator assembly, +5 volt power supply, auxiliary power supply, ac input terminal block, signal out terminal block, line filter, main power switch, heat/cool switch, power fuse, autobalance module, and fiberoptic module.

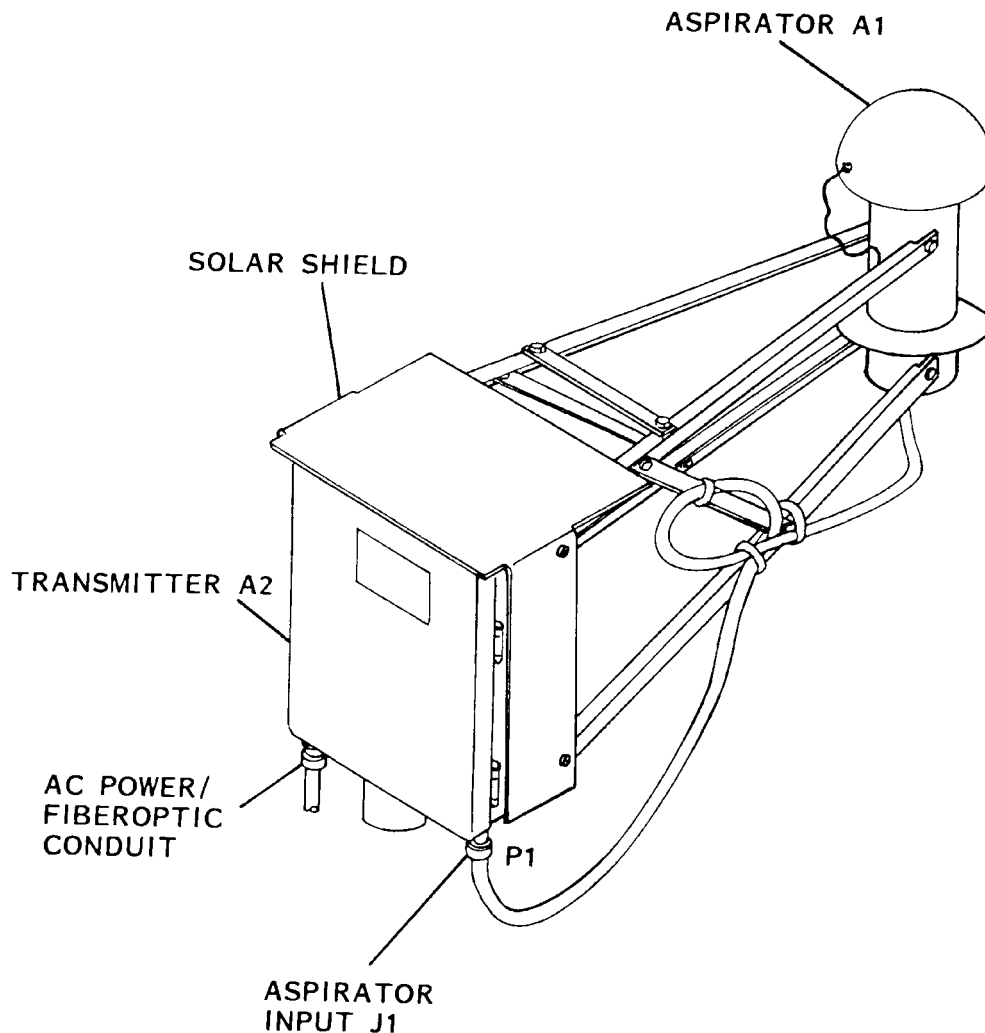


Figure 5.1.1. Temperature/Dewpoint Sensor Major Components

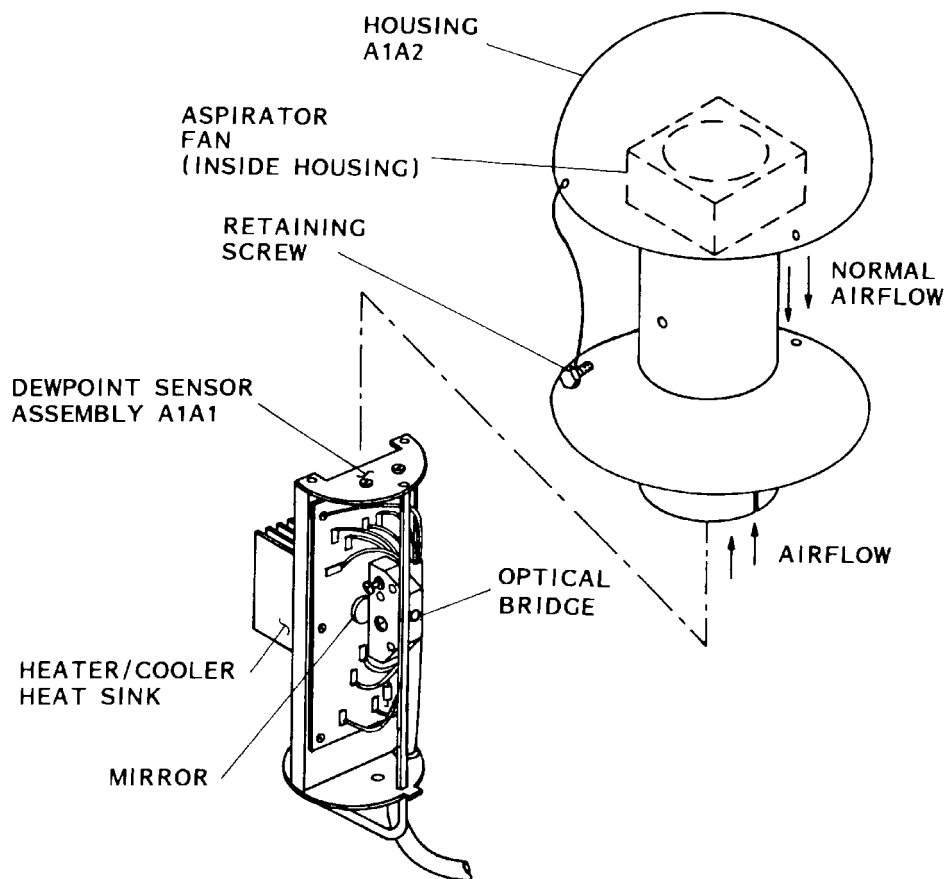


Figure 5.1.2. Aspirator Component Location

5.1.2.5.1 Transmit Logic Board 2MT4A2A1. The transmit logic board controls mirror heating and cooling to maintain dewpoint temperature at the mirror surface. It also processes the absolute and dewpoint temperature resistance sensor information into a serial digital data stream for transmission to the DCP. The transmit logic board contains a numeric data display for use in servicing the equipment. During system calibration, the transmit logic board receives a calibrated resistive value from the calibrator assembly in lieu of the ambient and dewpoint temperature resistive outputs. The model 1088 transmit logic board also contains self-test circuitry that enables it to test its power supplies and measurement circuits.

5.1.2.5.2 Calibrator Assembly 2MT4A2A2. The calibrator assembly consists of calibrator select switch S1 and associated calibrator resistors. The calibrator assembly enables the selection of fixed resistance values in place of the resistive temperature sensors for alignment and troubleshooting of the instrument's circuits. The model 1088 contains additional self-test selection circuitry that enables automatic selection of the calibrator resistors during diagnostic testing.

5.1.2.5.3 +5 Volt Power Supply 2MT4A2A3. The +5 volt power supply provides regulated 5V, 1.5-ampere power to the auxiliary power supply for the generation of $\pm 12V$ power. It also provides the main logic power supply voltage for the circuits on the transmit logic board.

5.1.2.5.4 **Auxiliary Power Supply 2MT4A2A4.** The auxiliary power supply supplies power to the thermoelectric pump in the dewpoint sensor assembly and supplies $\pm 12\text{V}$ power to the system. It also provides power to the lamp in the mirror/dewpoint sensor circuit. The auxiliary power supply receives a thermocontrol signal from the transmitter logic board and a power supply input signal from the +5 volt power supply. The thermocontrol signal controls the polarity of the control voltage applied to the thermoelectric pump. When the thermocontrol signal is positive, the pump signal is positive, indicating a heat condition. When the thermocontrol signal is negative, a cooling condition is indicated. Two models of auxiliary power supplies are used: 1063-2031 and 1063-06B. The applicable model number is stenciled in the upper right corner of the power supply board. The only difference between the models is how they generate the $\pm 12\text{V}$ outputs. The model 1063-2031 uses an internal oscillator, which is powered by the +5 volt power supply. The model 1063-06B uses full wave rectifier power from the 115 vac input.

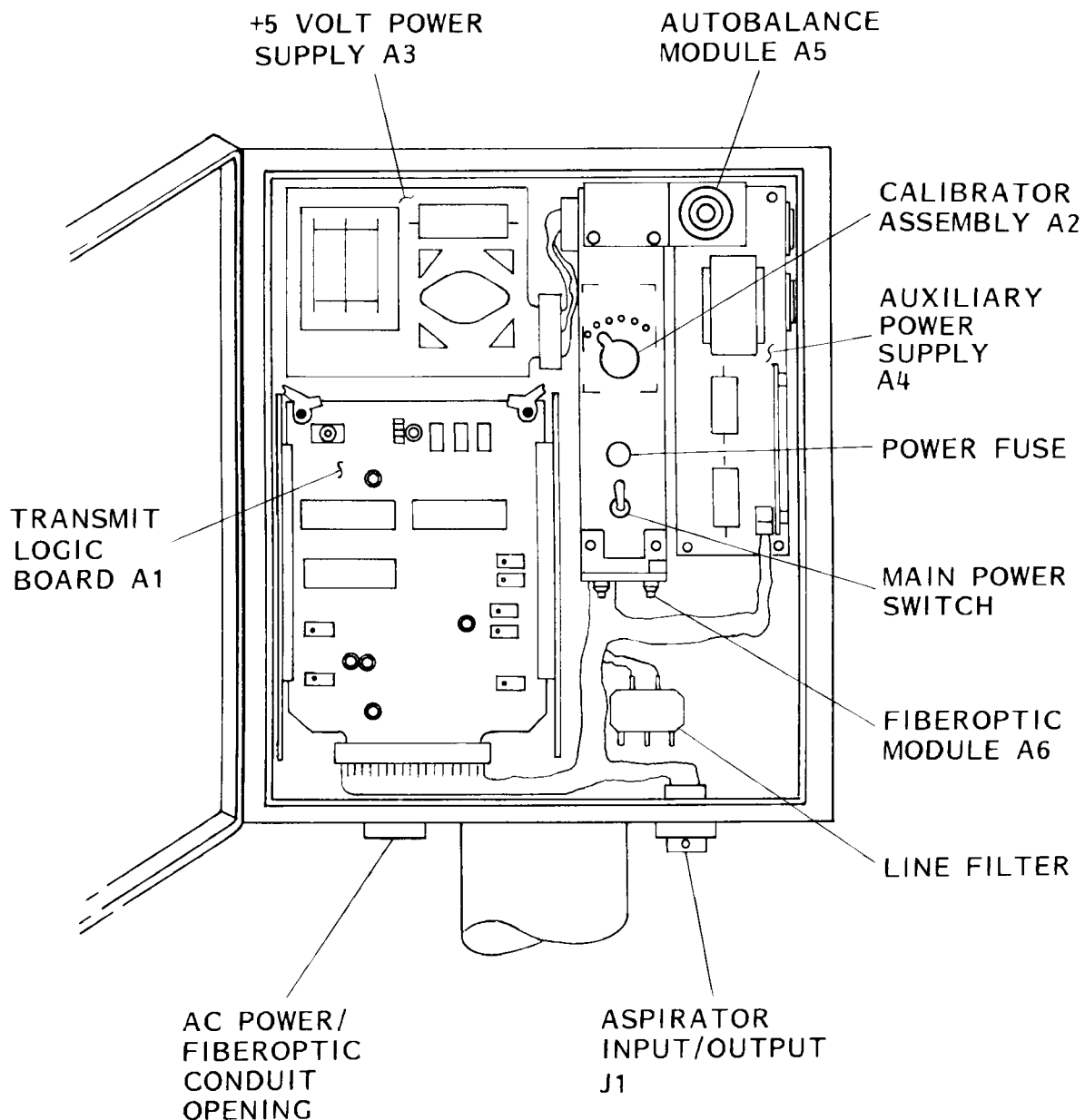


Figure 5.1.3. Transmitter Component Location

5.1.2.5.5 **Autobalance Module 2MT4A2A5.** The autobalance module automatically compensates for accumulated dirt and other visible contamination on the mirror surface, thereby increasing the time between maintenance cycles. The autobalance module is activated once each day to readjust the bias voltage on the mirror/dewpoint sensor circuit.

5.1.2.5.6 **Fiberoptic Module 2MT4A2A6.** The fiberoptic module handles the data transfers between the sensor and the DCP. For the 1088 sensor, data communication is half-duplex; i.e., the DCP polls the sensor for data and the 1088 responds. For the H083R, data communication is simplex (one way only), where the sensor outputs data at regular intervals.

5.1.3 TEMPERATURE/DEWPOINT SENSOR CONFIGURATIONS

The temperature/dewpoint sensor (P/N 62828-90114) has two possible configurations: the -30 (1088-20) and the -40 (R1063-20, Refurbished H083R). All FRU's in all configurations work similar to the descriptions given in Section 5.1.2. It should be noted however, that some FRU's are interchangeable between configurations and some are not. For this reason, the following information is given. See the parts list (located after the last chapter in volume II) for a complete listing of all parts in this sensor.

5.1.3.1 **FRU's Common to -30 and -40 Configurations.** There are six FRU's that are common to both configurations:

Power Supply, 5VDC	62828-90114-4
Power Supply, AUX	62828-90114-3
Autobalance Assy.	62828-90114-2
Aspirator Assy.	62828-90114-15
Dew Point Sensor Assy	62828-90114-21
Aspirator Housing Assy	62828-90114-22

5.1.3.2 **FRU's Unique to Each Configuration.** The following FRU's are unique to a particular configuration:

-10	(Modified by ECP F004 to become -30.)
-20	(Modified by ECP F004 to become -40.)
-30	Transmitter Enclosure 62828-90114-18
	Transmitter Logic Card 62828-90114-16
	Calibration Assy. 62828-90114-17
-40	Transmitter Enclosure 62828-90114-19
	Transmitter Logic Card 62828-90114-23
	Calibration Assy. 62828-90114-24